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Texas Technology 2003 Showcase

Using A Modern Computer Tool to Reduce the Operating Cost of Industrial Steam, Fuel & Electrical Systems

Using Modern Computer Tools to Reduce the Operating Cost of Industrial Steam, Fuel & Electrical Systems

- ◆ 50 mlb/hr Unaccounted For
- ◆ Reducing Operating Cost
- ◆ Computer Tools
- ◆ VISUAL MESA
- ◆ Examples
- ◆ What's it worth to you?

50 mlb/hr Unaccounted For

- ◆ LLL & LBL - 2%
- ◆ Refinery Steam System-Circumvents
- ◆ Steam Metering / Balances
- ◆ If You're Not Measuring It, You're Not Managing It.

Reducing Operating Cost

- ◆ Continually **Monitor** the entire Steam, BFW and Condensate systems and flags problems
- ◆ **Optimize** the entire steam, fuel & electrical system
- ◆ Evaluate “**What If**” cases
- ◆ **Auditing and Accounting.** Validate your data, trouble shoot, auditing and accounting.

Computer Tools

◆ PLUTO

- linear, economics, properties, optimization, lumped production/consumption, constant enthalpy headers.

◆ Spreadsheets

- steam balance, sub-balances, audits

◆ SBP

- database, steam balance, sub-balances, audits

◆ MESA

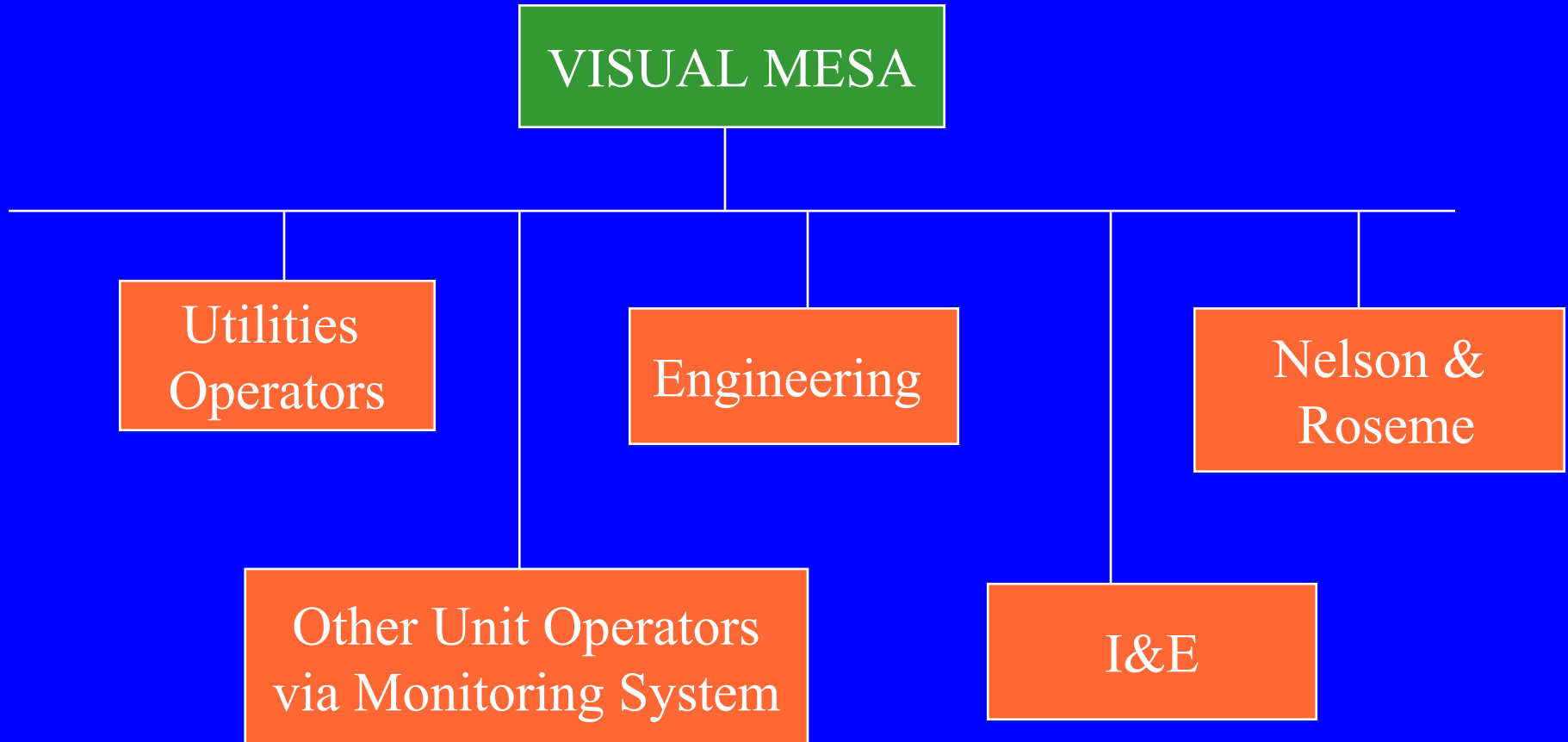
- nonlinear, as-is, economics, properties, what-if, opt.
- Need to be a geek

◆ VISUAL MESA - Modern Computer Tool

Visual MESA

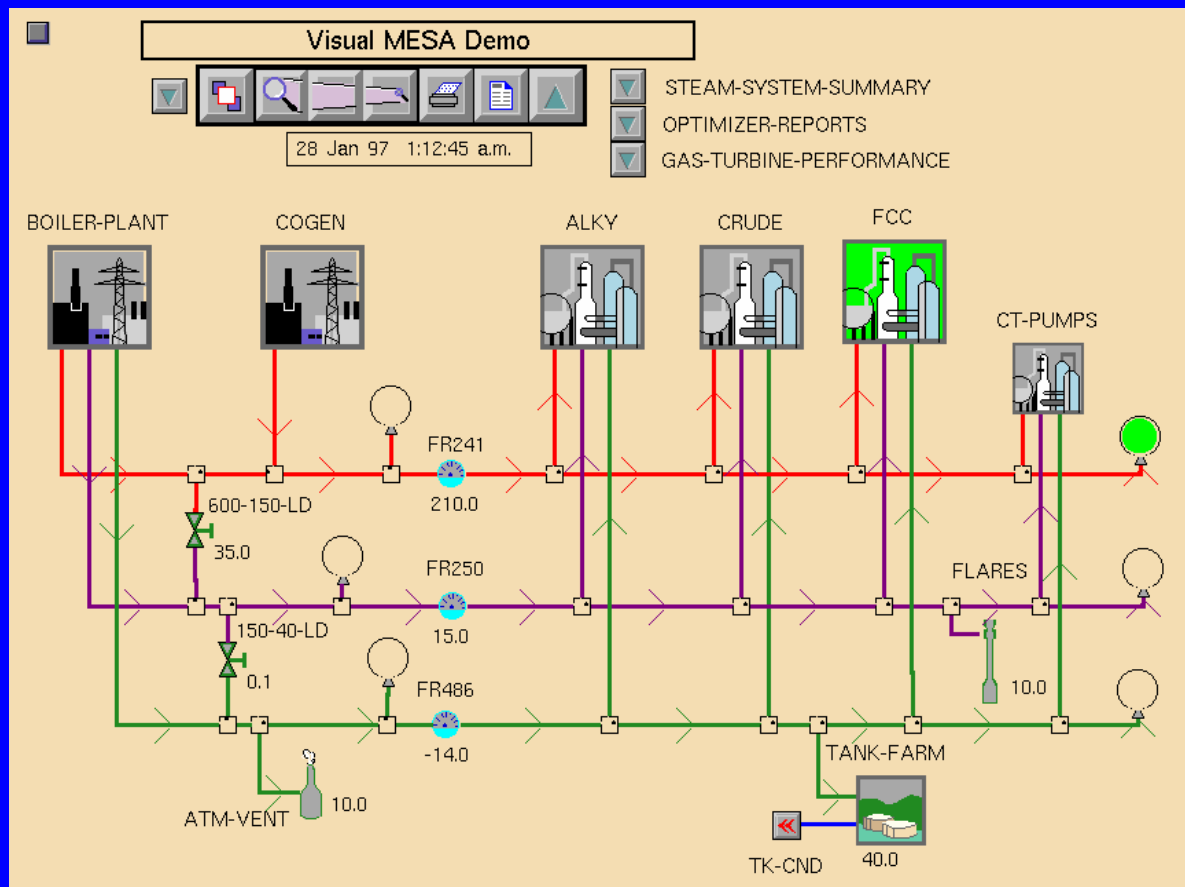
- ◆ Models the Steam System “As Is”
- ◆ Object Oriented Models
- ◆ Non-Linear Equipment and Thermodynamics
- ◆ All Common Unit Operations: Boilers, Turbines
- ◆ SQP Optimization
- ◆ Simple User Interface
- ◆ Real-Time Data Links
- ◆ Connectivity

Users



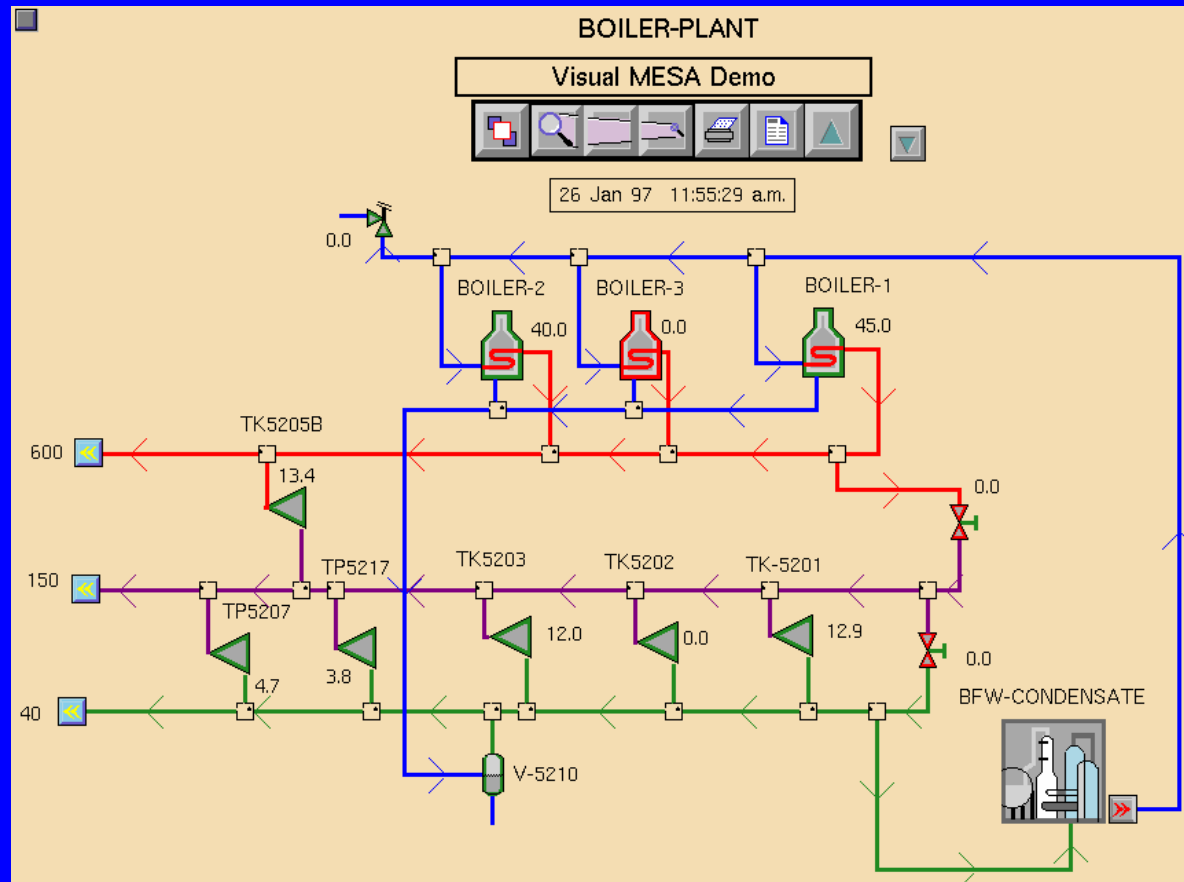
Monitoring: Navigation

“Click on Anything”

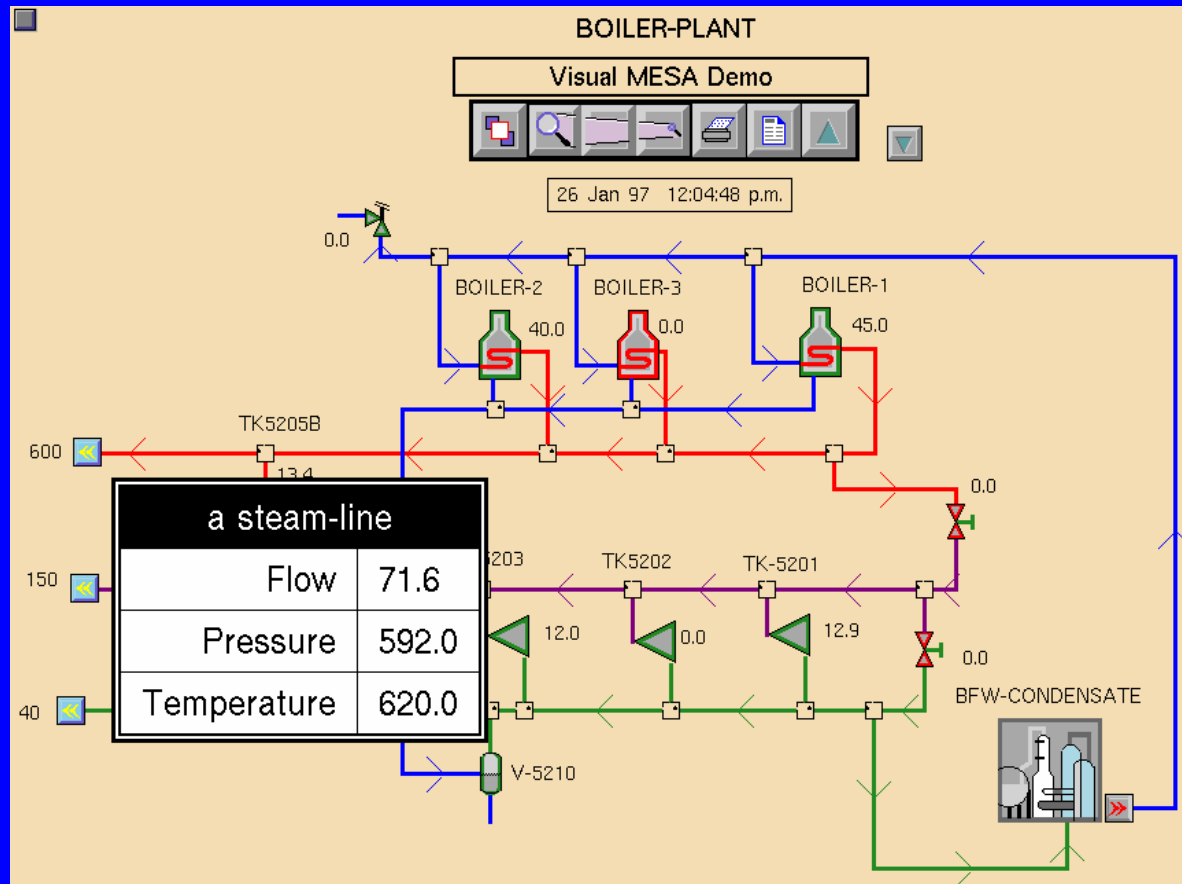


- Plants
- Lines
- Equipment

Monitoring: Click on a Plant



Monitoring: Click on a Line



Monitoring: Click on a Piece of Equipment

valve
trend flow meter
don't use meter
equipment information

Valve Information

600-150-LD

NONE

Input Information

Meters

STATUS

Flow: 20

Exhaust Pressure: 0

☒ On

☐ Off

☐ Unavailable

☒ ALERT Open Valve

19.0

FI-198

NONE

NONE

Output Information

Flow: 20.0

Reference Case Information

Reference Status: NONE

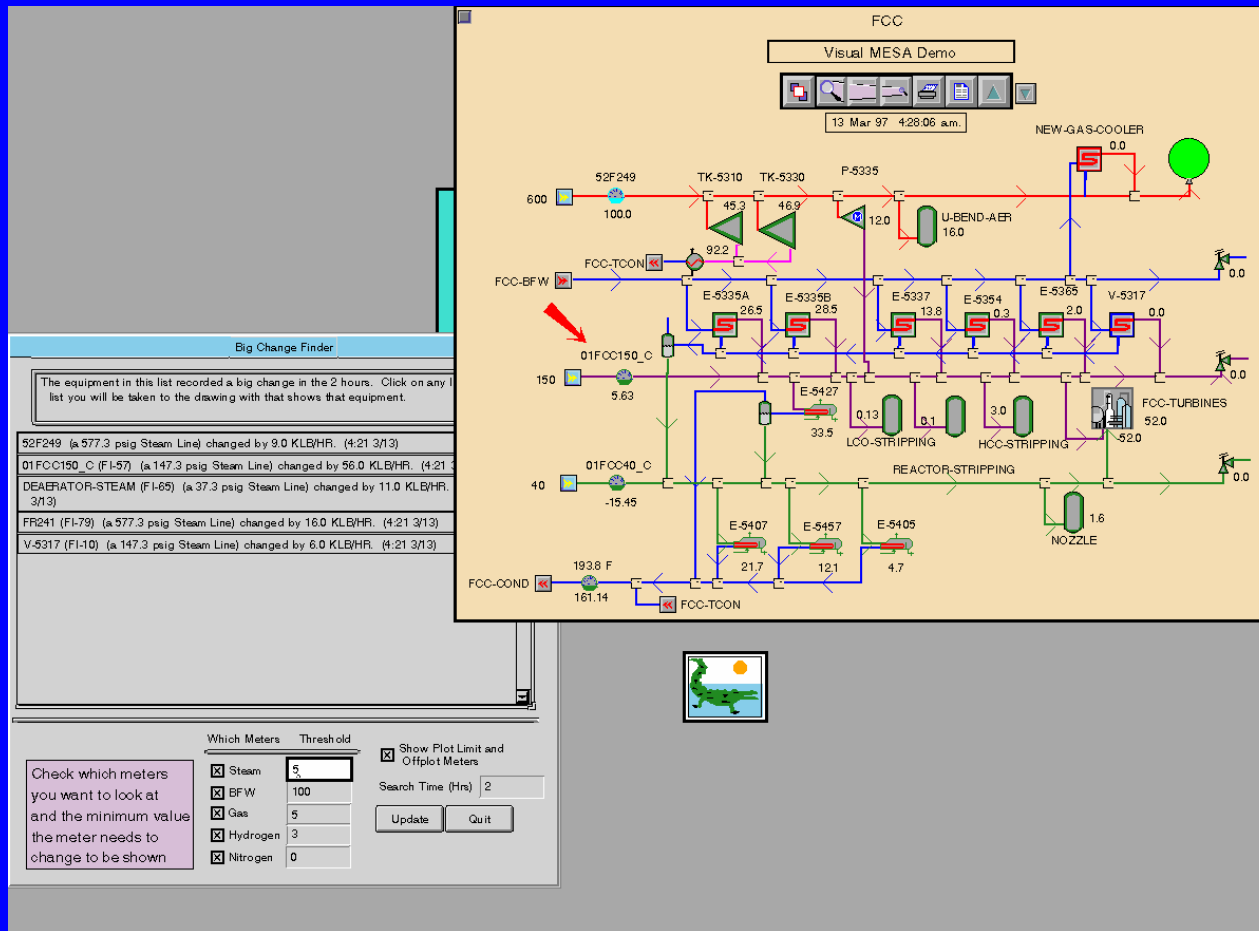
Reference Flow: NONE

Normal Operating Status: G2

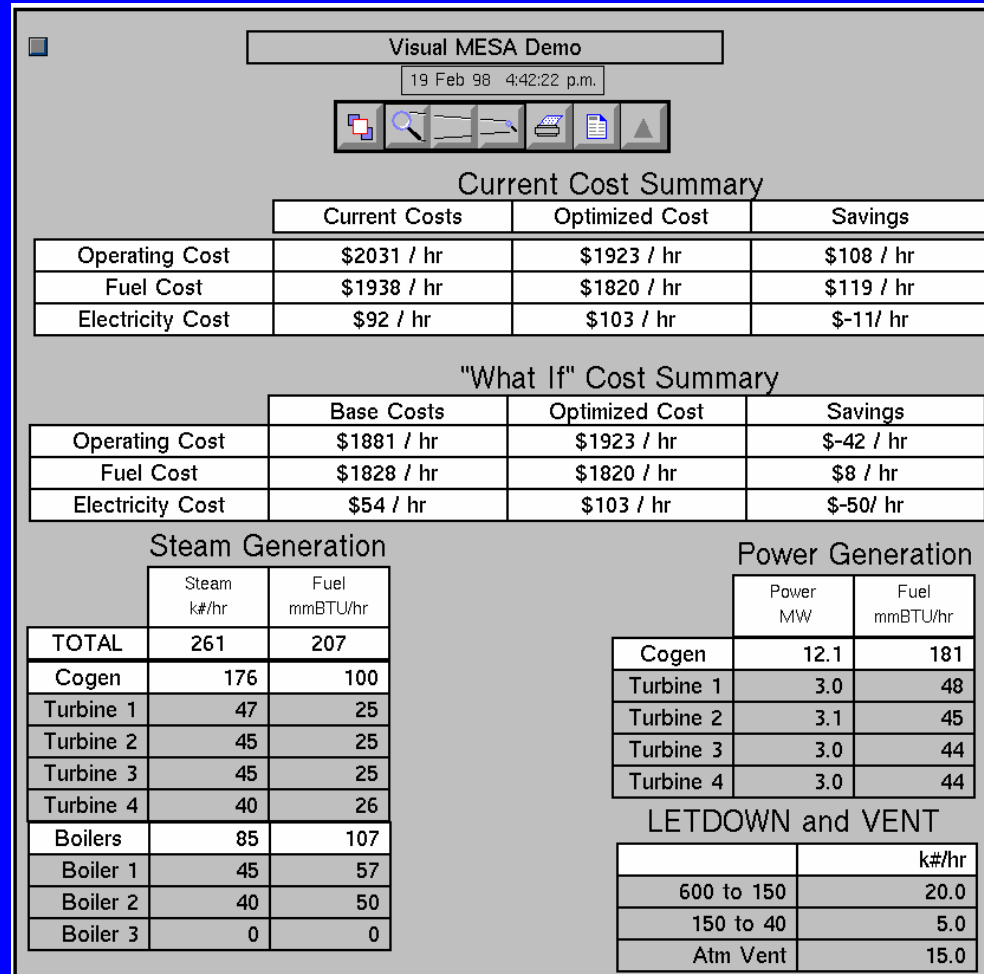
OK

Cancel

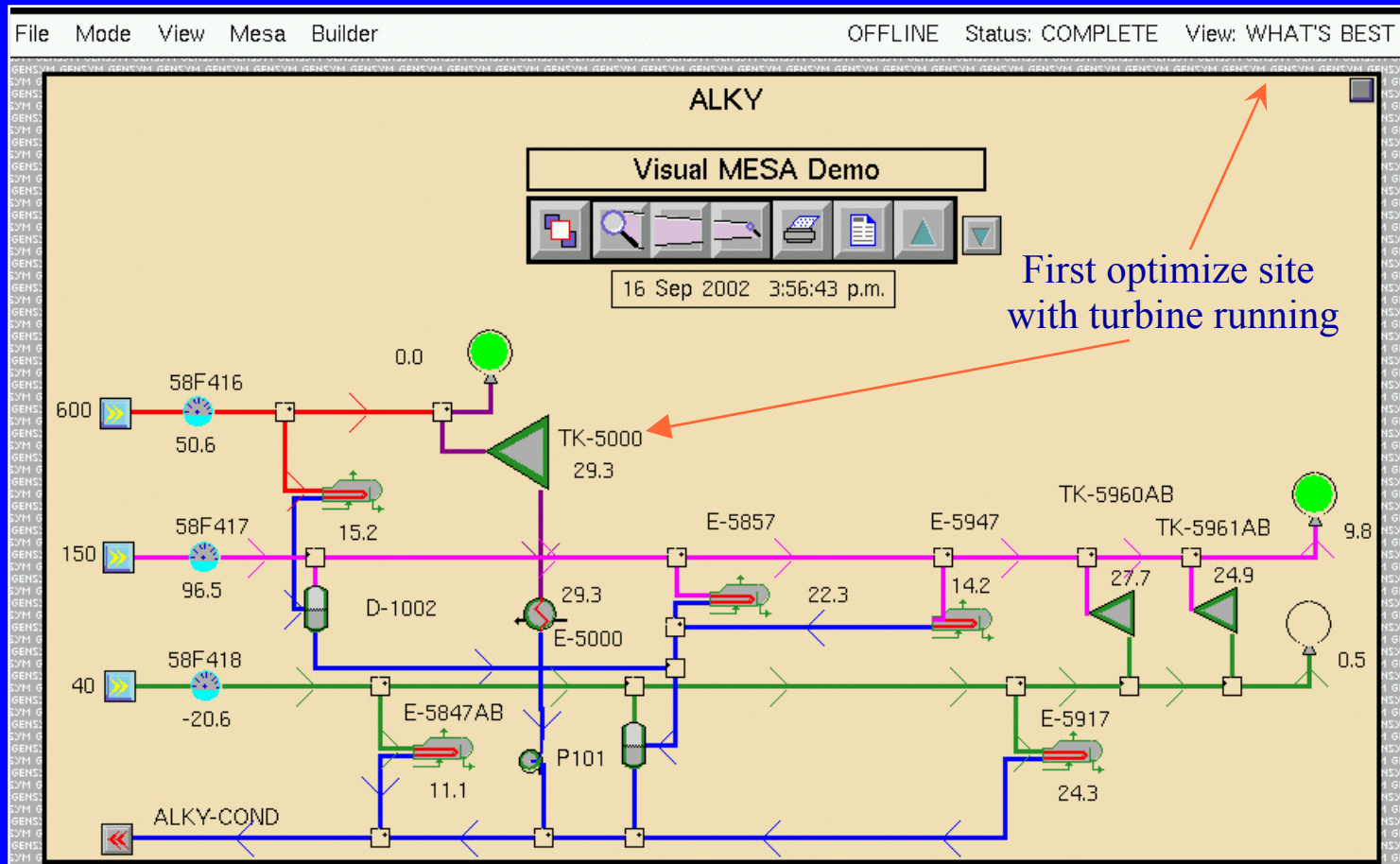
Monitoring: Alligator



Monitoring: Reports



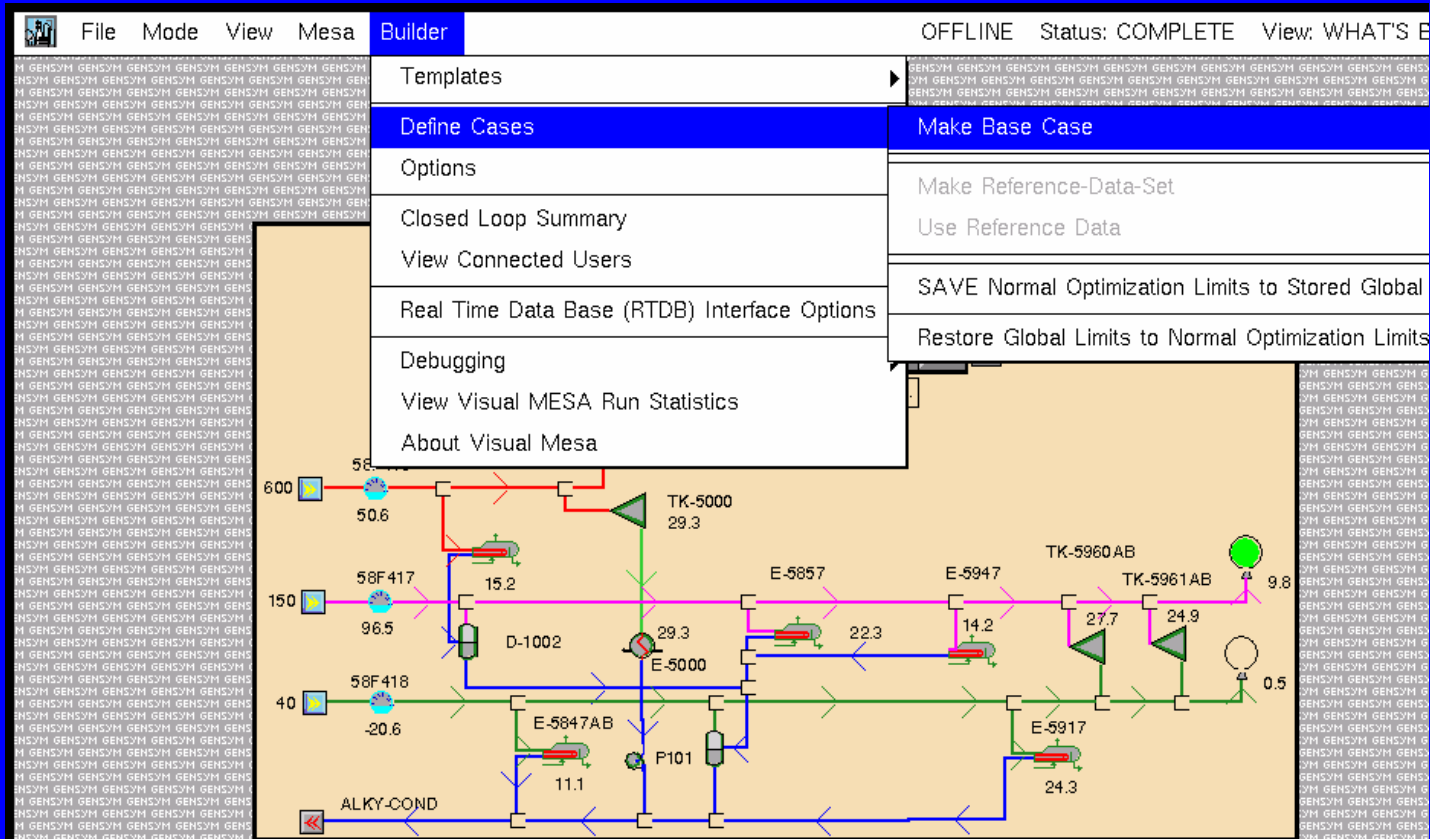
“What If” Replace a turbine with a motor.



“What If” Replace a turbine with a motor. The Base Case

Make it the base case:

Click on Builder, Define Cases, Make Base Case



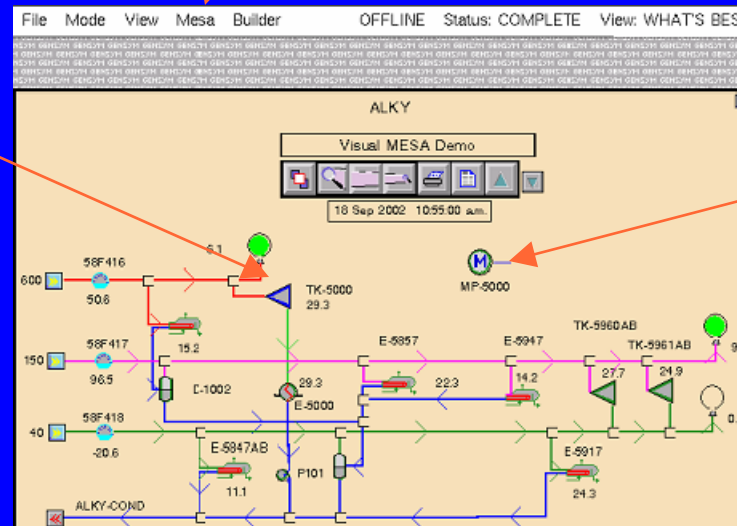
“What If”

Replace a turbine with a motor.
Make The New Case

3. Run MESA with balloons locked

1. Turn off the turbine

2. Add the motor



“What If”

Replace a turbine with a motor.



Run The New Case

Run MESA

☒ Run MESA with BALLOONS Locked
☐ Calibrate MESA

Calibrate MESA: Runs the MESA simulation and optimization with the current data in the model and fills the balloons with the mass balance errors. Used for every day optimization.

Run MESA with BALLOONS Locked: Runs the MESA optimization holding the balloon mass balance errors constant. Used for case evaluation.

Maximum SQP Level:  

Maximum SQP Level specifies what SQP optimizers and constraints are used. If the SQP level of a optimizer or constraint is \leq Maximum SQP Level then the optimizer is used.

Setting Maximum SQP Level to 0 shuts off all SQP optimization

SQP optimizers are grouped into the following levels:

- Level 1: Pressure control devices (boilers, letdown valves, vents)
- Level 2: Continuous optimization variables
- Level 3: Start/Stop Optimization variables (pump swaps)
- Level 4: Optimization variables that are potentially unsafe or effect process yield

Run MESA
with Balloons
Locked

“What If”

Replace a turbine with a motor.
Evaluate Savings

Visual MESA Economic Summary
Visual MESA Demo 18 Sep 2002 1:34:14 p.m.

		Base Case	Current Case	Savings
	Oper. Cost (\$/HR)	7348	7328	20
1				
2	Fuel Use (\$/HR)	6551	6390	161
3	Power Use (\$/HR)	635	776	-141
4	Other Use (\$/HR)	162	162	0

View Fuel and Power Cost Detail View Other Charges Cost Detail
Lost Opportunity Trend Done

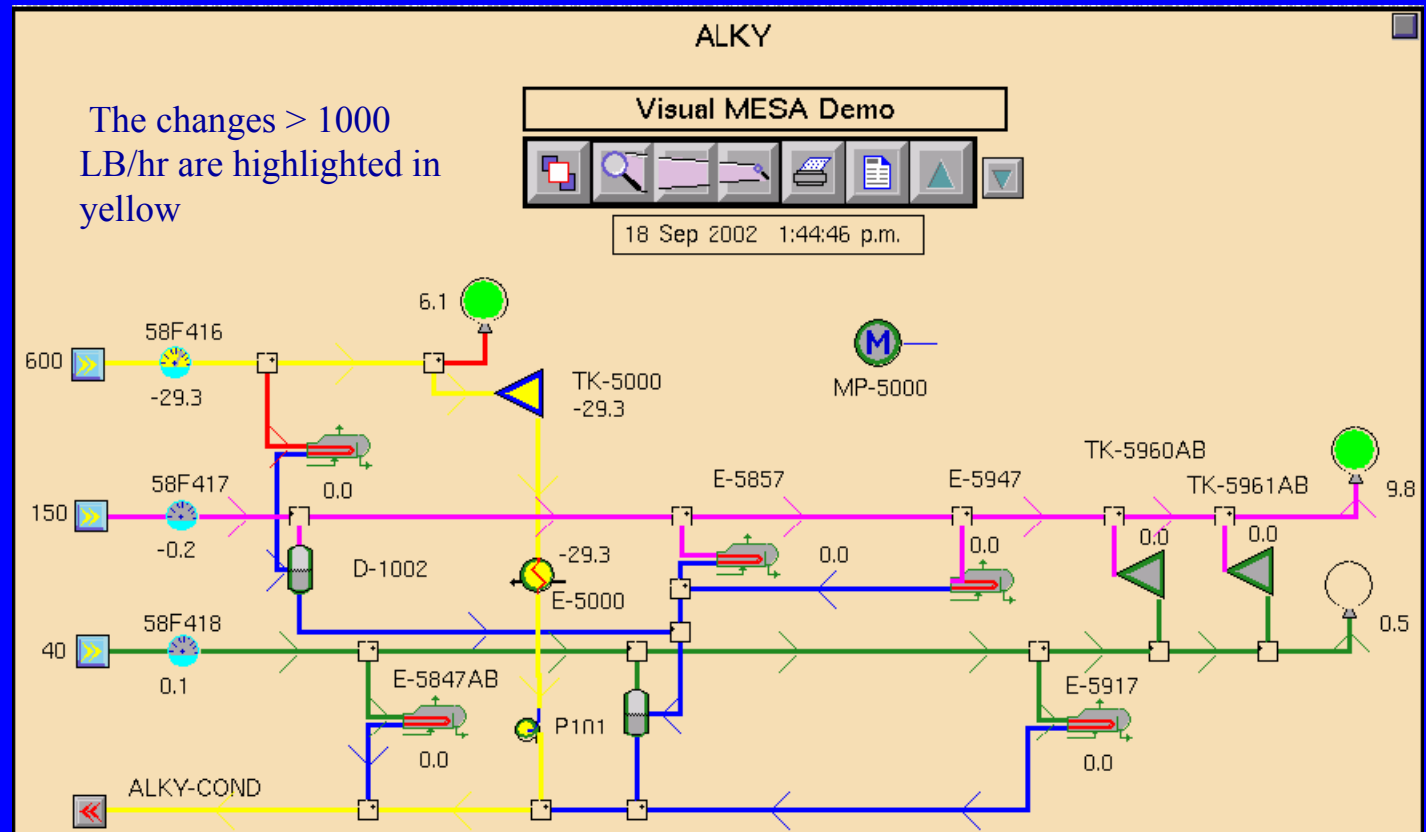
Savings

“What If”: View Delta Case

“What If”: View Delta Case

Choose This

Shows the difference between the Base
and the new case.

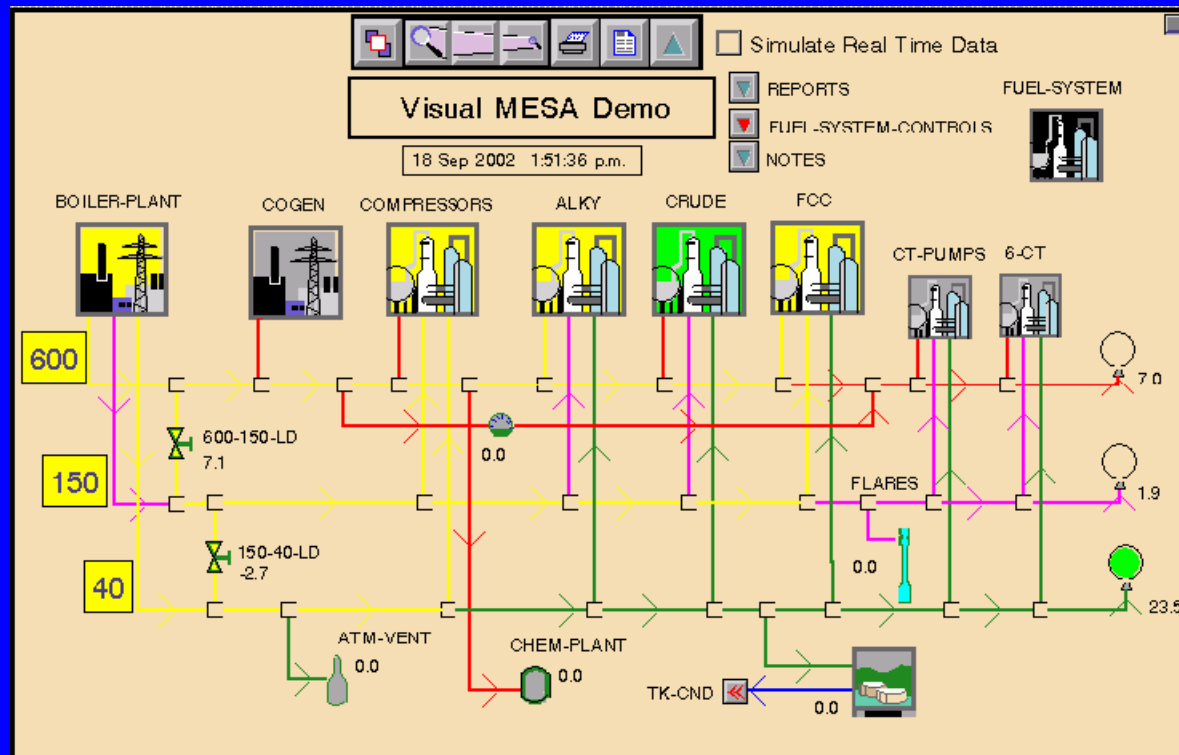


View Delta Case

Shows the difference between the Base
and the new case.

“What If”:

The entire site.



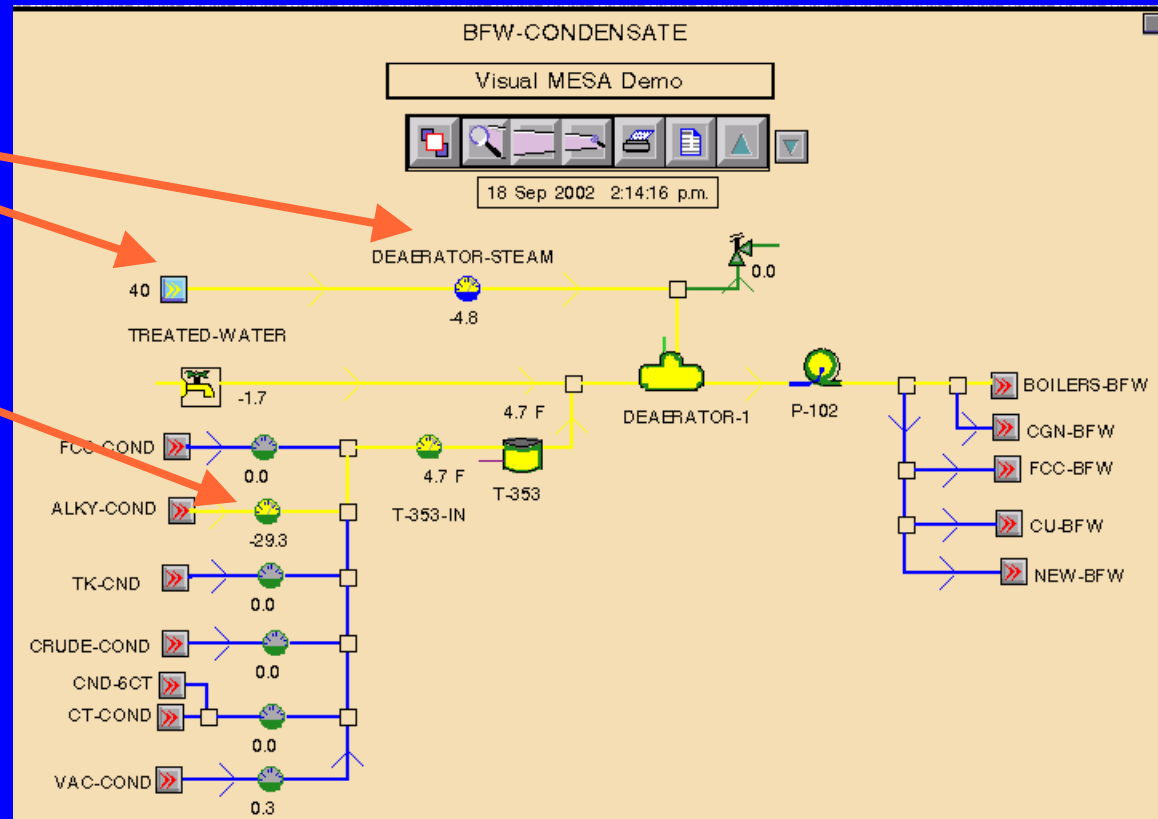
“What If”:

View Delta Case

Shows the difference between the Base and the new case.

Less steam make,
less bfw, less
deaeration
steam

Alky condensing
turbine is off



Optimization

What does visual mesa optimize?

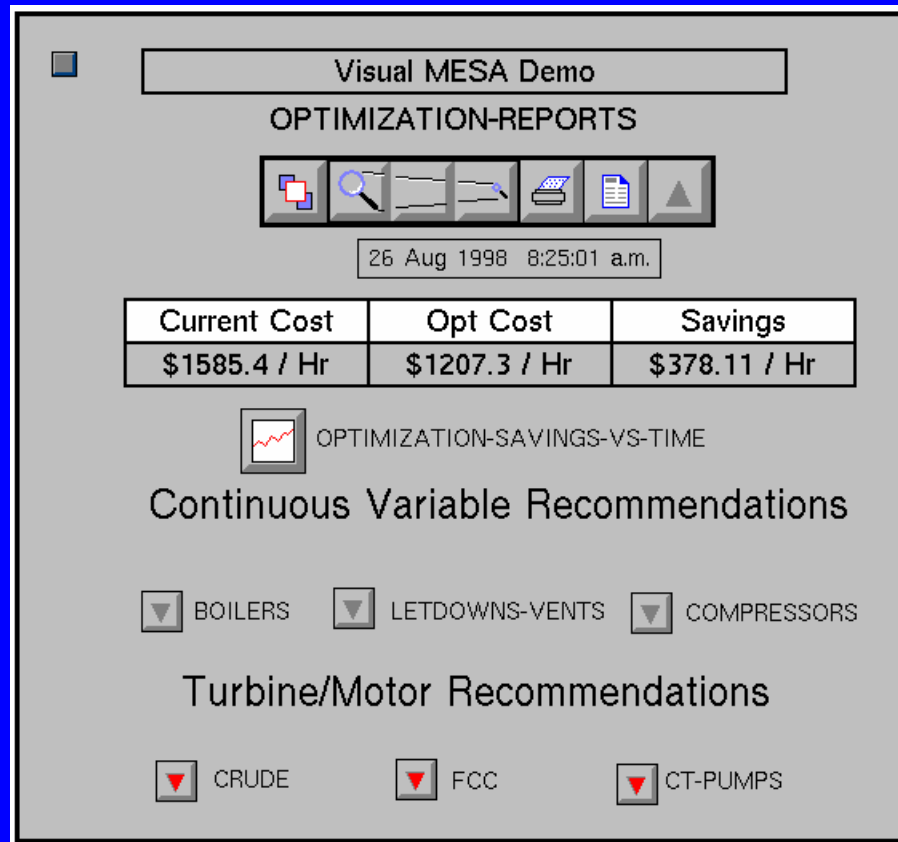
- ◆ Pumps Drivers
- ◆ Turbogenerators
- ◆ Steam Production
- ◆ Gas Turbines

Optimization

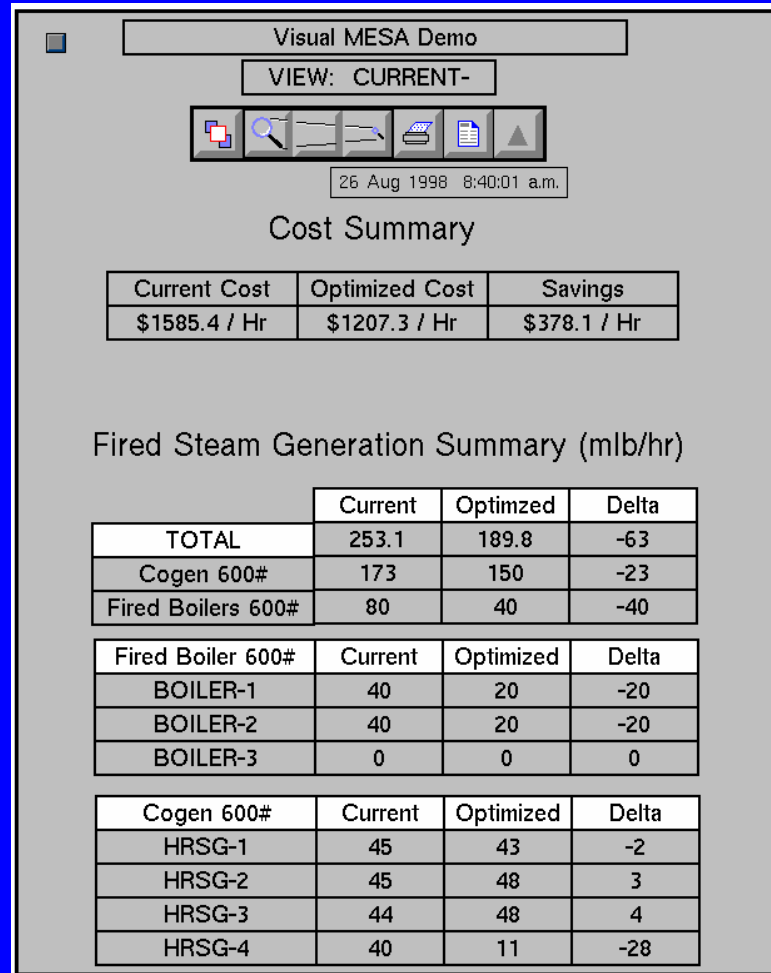
How does visual mesa optimize?

- ◆ Open Loop (Advisory)
- ◆ Closed Loop

Optimization



Optimization



Optimization: Pumps Drivers

CT-PUMPS, MAX SQP Level = 4

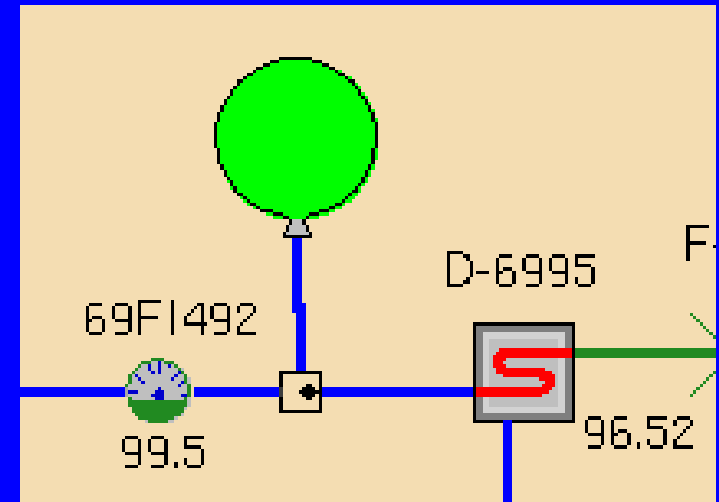
Total Pumps to Swap = 2

	Pump	Plant	Sqp-L	Driver	Current	Recomend	Hp
1	TP-101	CT-PUMPS	3	TURBINE	ON	OFF	500.0
2	MP-101A	CT-PUMPS	3	MOTOR	OFF	ON	500.0
3	-						
4	TP-102	CT-PUMPS	3	TURBINE	OFF	OFF	250.0
5	MP-102A	CT-PUMPS	3	MOTOR	ON	ON	250.0
6	-						
7	TP-103	CT-PUMPS	3	TURBINE	OFF	OFF	500.0
8	MP-103A	CT-PUMPS	3	MOTOR	ON	ON	500.0
9	-						
10	TP-104	CT-PUMPS	3	TURBINE	ON	ON	500.0
11	MP-104	CT-PUMPS	3	MOTOR	OFF	OFF	500.0
12	-						
13	TP-105	CT-PUMPS	3	TURBINE	OFF	OFF	250.0
14	MP-105	CT-PUMPS	3	MOTOR	ON	ON	250.0
15	-						
16	-						
17	-						
18	-						
19	-						
20	-						

OK

Auditing & Accounting: Balloons

- ◆ Are Placed Where There is a Closed Mass Balance
- ◆ Helps Find Bad Meters
- ◆ Dynamically Shows Meter Error



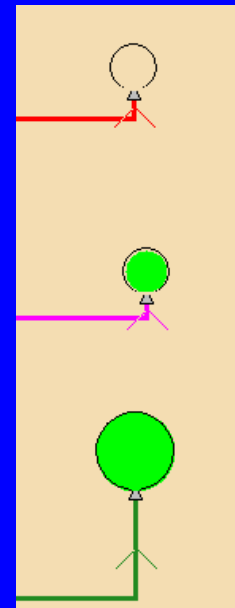
Auditing & Accounting: Balloons

Dynamically Show Meter Error

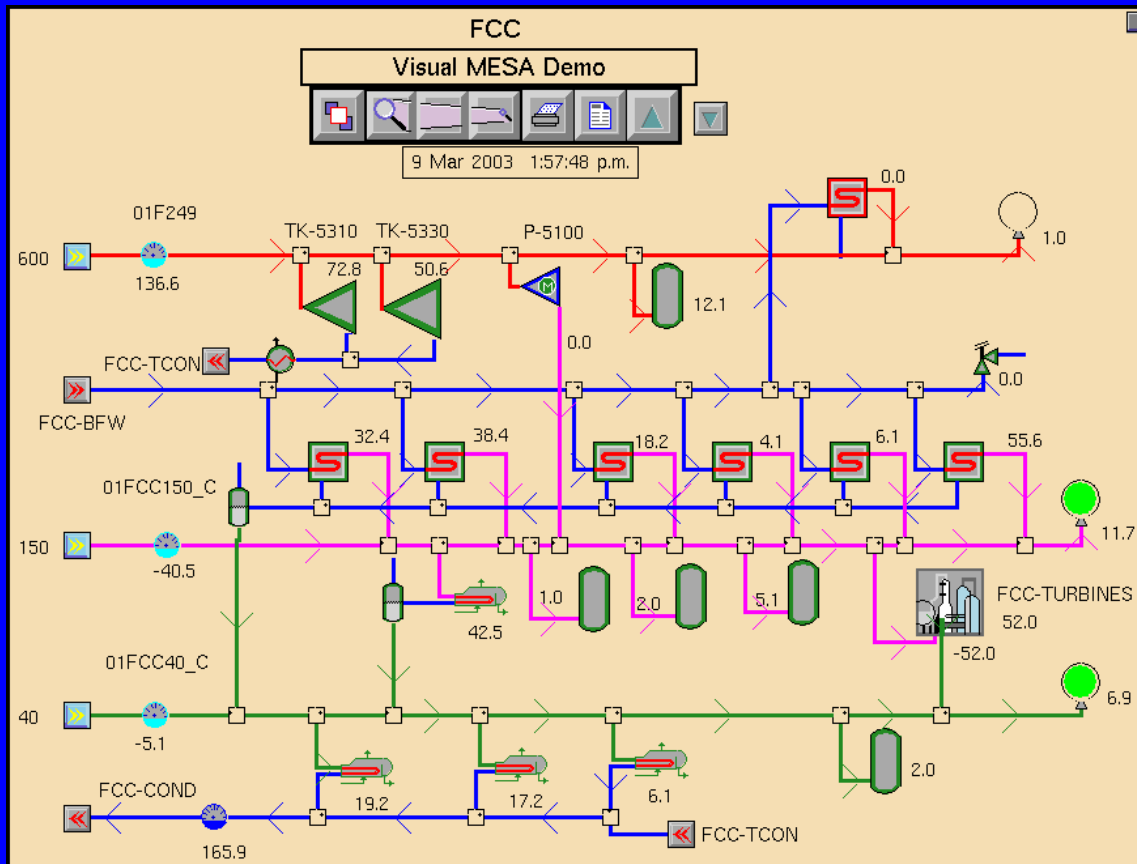
$\text{error} < 5\%$

$5\% < \text{error} < 15\%$

$\text{error} > 15\%$



Auditing & Accounting



Visual Mesa, What's It Worth?

- | | |
|----------------------------------|--------------|
| ◆ Continuous Monitoring | \$\$\$ |
| ◆ Optimizes entire steam system | >\$500,000 |
| ◆ Evaluates “What If” cases | \$\$\$ |
| ◆ Validates data and helps with: | >\$1,000,000 |
| – auditing | |
| – accounting | |
| – troubleshooting | |
| – eliminate waste | |

Visual Mesa Installations

Sites:	Company:	Comments:
5	Chevron/Texaco	4 Refineries, 1 Chemical
2	BP	1 Refinery, 1 Chemical
1	Marathon-Ashland	1 Refinery
5	Shell/Equilon/Motiva	5 Refineries, Chemicals
1	Air Liquide	ASU/Cogen
2	Phillips	2 Ref/Chemical
1	Rohm-Haas	1 Chemical
5	Refining Co./Chem Co.	3 Ref, 2 Ref/Chem-closed loop
1	Aramco	1 Gas Plant
1	Dow	1 Chemical
1	Irving Oil Ltd.	1 Refining
25	Total Sites	

Meeting Your Needs

**We can meet your energy
management needs!**

- ◆ Simulation
- ◆ Optimization
- ◆ “What If” Studies
- ◆ Monitoring
- ◆ Auditing & Accounting
- ◆ Interface
- ◆ Easy to use
- ◆ Maintenance